

PCTWORLD INTELLECTUAL PROPERTY
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE

WO 9605133A1

| | | |
|---|----|--|
| (51) International Patent Classification ⁶ : B65H 29/66 | A1 | (11) International Publication Number: WO 9605133 (43) International Publication Date: 22 February 1996 (22.02.96) |
| (21) International Application Number: PCT/US95/08821 | | (81) Designated States: AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TT, UA, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, MW, SD, SZ, UG). |
| (22) International Filing Date: 14 July 1995 (14.07.95) | | |
| (30) Priority Data: 08/291,806 17 August 1994 (17.08.94) US | | Published <i>With international search report.</i> |
| (71) Applicant: KIMBERLY-CLARK CORPORATION [US/US]; 401 North Lake Street, Neenah, WI 54956 (US). | | |
| (72) Inventors: BEHNKE, Janica, Sue; 4330 West Edgewood Drive, Appleton, WI 54915 (US). BAUM, Scott, Allen; 9291 Alpine Road, Fremont, WI 54950 (US). ABBA, Rodney, Lawrence; 3645 Shangrila Point, Oshkosh, WI 54904 (US). | | |
| (74) Agents: CROFT, Gregory, E. et al.; Kimberly-Clark Corporation, 401 North Lake Street, Neenah, WI 54956 (US). | | |
| (54) Title: ROLLED TISSUE PRODUCTS CONTAINING DISCRETE OVERLAPPED TISSUE SHEETS | | |
| (57) Abstract | | |
| <p>A tissue product and method are disclosed in which individual discrete tissue sheets (11-15) which overlap each other are wound into a roll. The overlapping provides a means for pop-up, one-at-a-time tissue dispensing. Preferably, the sheets are dispensed axially from a coreless roll. The overlapping sheets within the roll can be interleaved as well as overlapped to increase the frictional engagement between successive sheets. This product form is useful for a variety of tissue products, such as facial tissue, bath tissue, kitchen towels and napkins.</p> | | |
| | | |

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

| | | | | | |
|----|--------------------------|----|--|----|--------------------------|
| AT | Austria | GB | United Kingdom | MR | Mauritania |
| AU | Australia | GE | Georgia | MW | Malawi |
| BB | Barbados | GN | Guinea | NE | Niger |
| BE | Belgium | GR | Greece | NL | Netherlands |
| BF | Burkina Faso | HU | Hungary | NO | Norway |
| BG | Bulgaria | IE | Ireland | NZ | New Zealand |
| BJ | Benin | IT | Italy | PL | Poland |
| BR | Brazil | JP | Japan | PT | Portugal |
| BY | Belarus | KE | Kenya | RO | Romania |
| CA | Canada | KG | Kyrgyzstan | RU | Russian Federation |
| CF | Central African Republic | KP | Democratic People's Republic of Korea | SD | Sudan |
| CG | Congo | KR | Republic of Korea | SE | Sweden |
| CH | Switzerland | KZ | Kazakhstan | SI | Slovenia |
| CI | Côte d'Ivoire | LJ | Liechtenstein | SK | Slovakia |
| CM | Cameroon | LK | Sri Lanka | SN | Senegal |
| CN | China | LU | Luxembourg | TD | Chad |
| CS | Czechoslovakia | LV | Latvia | TG | Togo |
| CZ | Czech Republic | MC | Monaco | TJ | Tajikistan |
| DE | Germany | MD | Republic of Moldova | TT | Trinidad and Tobago |
| DK | Denmark | MG | Madagascar | UA | Ukraine |
| ES | Spain | ML | Mali | US | United States of America |
| FI | Finland | MN | Mongolia | UZ | Uzbekistan |
| FR | France | | | VN | Viet Nam |
| GA | Gabon | | | | |

ROLLED TISSUE PRODUCTS CONTAINING DISCRETE OVERLAPPED TISSUE SHEETSBackground of the Invention

Household tissue products, such as facial tissue, bath tissue, 5 kitchen towels and napkins, are available in two basic product forms. One product form is a continuous roll, which is commonly used for bath tissue and kitchen towels. The individual sheets within the roll are separated by a line of perforations which must be torn as the sheet is removed from the roll. Oftentimes the perforation lines do not tear 10 cleanly, resulting in ripped sheets and ragged edges.

The other product form is a stack of individual sheets as is commonly used for facial tissue and dinner napkins. The tissues or napkins can be interfolded for pop-up dispensing or they can be simply laid one on top of the other. The stacked product form usually dispenses 15 very well, but a flat-stacked product has limitations with respect to the size of the "footprint" of the box in which the tissues are stacked. Inherently, stacked tissues require a relatively high package volume for a given number of sheets as compared to the roll product form. Also, in 20 an effort to reduce the size of the dispensing carton, facial tissues and dinner napkins are always dispensed in a folded configuration, which requires the user to unfold the dispensed tissue prior to use.

Hence there is a need for different tissue product forms that overcome these deficiencies and provide the consumer with alternative choices.

25

Summary of the Invention

It has now been discovered that a variety of tissue products can be provided in a roll of separate individual or discrete sheets, which can be folded or unfolded, and dispensed one-at-a-time. Advantageously, the 30 roll of individual sheets can be a coreless roll which dispenses the tissues from the center of the roll in the axial direction. This invention provides an alternative product form for products typically dispensed in folded form, such as facial tissues and napkins, and eliminates some disadvantages associated with perforated roll products.

Hence in one aspect, the invention resides in a tissue product comprising a roll of multiple, discrete, consecutive tissue sheets which overlap each other in the circumferential direction of the roll. The roll can be coreless for axial or circumferential dispensing, or it can

5 be cored for circumferential dispensing. The roll of discrete sheets can be contained within any suitable dispensing carton which permits removal of the individual sheets, or the roll may be used without a carton as is the case for conventional kitchen towels and bath tissue. As the individual sheets are dispensed, the sheet being withdrawn is in

10 frictional engagement with the following sheet, causing the following sheet to "pop up" for subsequent withdrawal. The degree of overlap necessary to effectively dispense will depend on the surface characteristics of the particular sheets and the winding tension within the roll. In order to increase the frictional engagement, the sheets can

15 be folded, overlapped and interleaved. For purposes herein, interleaving is a form of the broader concept of overlapping. Dispensing can be either axially from the center of the roll or circumferentially from the outer surface of the roll.

In another aspect, the invention resides in a method for making a

20 tissue product comprising the steps of: (a) cutting a continuous sheet of tissue into discrete, consecutive sheets; (b) overlapping each sheet with the previous sheet; and (c) winding the overlapped sheets into a roll. The resulting roll of discrete, individual sheets can be placed in a carton for protection and/or for dispensing.

25 As used herein, a "tissue" sheet is a low density paper sheet useful for products such as facial tissue, bath tissue, paper kitchen towels, dinner napkins and the like. In the case of facial tissues, the discrete tissue sheets can be assembled into the roll in a variety of ways, as will be described in greater detail in connection with the Drawing. In

30 the simplest form, for example, the sheets can be simply overlapped in an unfolded state. Alternatively, the sheets can be V-folded, C-folded, Z-folded or otherwise folded as desired and thereafter simply overlapped. Alternatively, the sheets can be overlapped and subsequently folded to provide an interleaved form of overlap to further increase frictional

35 engagement.

In the case of napkins, which tend to be of a larger size than facial tissues, it is preferable that the individual napkins be folded into quadrants or otherwise as is common for such products, and

thereafter simply overlapped and wound into the roll. Interleaving is also possible depending on the folding pattern. Either form of overlapping provides a unique pop-up dispensing product for dinner napkins.

- 5 In the case of tissue products that are conventionally made in roll form, such as kitchen towels and bath tissue, the individual sheets can be overlapped or interleaved, either folded or unfolded as desired. If a cored roll is used, the products of this invention can be used on conventional bath tissue or kitchen towel spindles. If a coreless roll
10 is used, these products can be dispensed anywhere, such as counter tops or toilet covers as is the case with facial tissues.

The extent of sheet overlap in all cases will depend on the characteristics of the individual sheets, winding tension, the roll size and the dispensing attribute desired. Factors such as embossing,
15 layering, furnish, composition, calendering, etc. all affect the sheet characteristics. Particularly for the coreless roll, the extent of sheet overlap can be intentionally varied within the roll in order to maintain proper dispensing throughout the roll by taking into account the relatively small, tight space in the center of a fresh roll, compared to
20 the larger airspace present after most of the roll has been dispensed. In some cases, the degree of overlap will be greater at the periphery of the fresh roll than it is towards the center of the roll. In other cases, however, the centermost sheet will have a higher degree of overlap. Numerically, the amount of sheet overlap will be at least about
25 1/8 inch or greater, more specifically about 1 inch or greater, still more specifically about 2 inches or greater. If the extent of overlap becomes too great, multiple sheet dispensing occurs.

Brief Description of the Drawing

- 30 Figure 1 is a perspective view of a wound coreless roll of discrete sheets in accordance with this invention, illustrating pop-up axial dispensing of the sheets from the center of the roll.

Figure 2 is a perspective view of a wound coreless roll as shown in Figure 1, without illustrating axial withdrawal of the sheets.

- 35 Figure 3 is a perspective view of a dispensing carton containing the roll of Figure 2, illustrating axial dispensing.

Figure 4 is a perspective view of a dispensing carton containing the roll of Figure 2, illustrating circumferential dispensing.

Figures 5 and 5A are a plan view and side view, respectively, of overlapped, distinct individual tissue sheets to be wound into a roll in accordance with this invention.

- 5 Figures 6 and 6A are a plan view and a side view, respectively, of V-folded tissue sheets which have been overlapped and interleaved in accordance with this invention.

Figures 7 and 7A are a plan view and a side view, respectively, of C-folded tissue sheets which have been overlapped and interleaved in accordance with this invention.

- 10 Figures 8 and 8A are a plan view and a side view, respectively, of C-folded tissue sheets similar to those of Figures 7 and 7A, which have been overlapped and interleaved in an alternating manner in accordance with this invention.

- 15 Figure 9 is a schematic view of a method for producing wound, distinct tissue sheets in accordance with this invention.

Detailed Description of the Drawing

Referring to Figure 1, a schematic perspective view of a tissue product made in accordance with the present invention containing discrete overlapped sheets is shown. Outer sheets 11 and 12 are referenced, as well as sheets 13, 14 and 15. Additional sheets comprising the body of the roll are not numbered. The total number of sheets in the roll would be equal to the desired sheet count for the bath, facial, towel or napkin product. Inner sheets 13 and 14 are kept in place by the roll integrity for pop-up dispensing, since this particular execution is that of a coreless roll with axial center dispensing. Sheet 15 is shown partially removed from the roll 10 in a condition that would generally occur after dispensing the previous sheet. Such sheets have a partially-curved, neater appearance as compared to conventional multifolded products. In dispensing, sheet 15 is pulled outward from roll 10. The overlapping of sheet 15 with sheet 14 causes sheet 14 to follow sheet 15 partially from roll 10 until there is no longer adequate pressure and contact between the sheets, at which time sheet 14 will no longer move with sheet 15, leaving it in position for the next use.

- 35 Figure 2 shows roll 10 as it would look prior to placing it within suitable packaging. The overlapping of the sheets can be varied, as will be described hereinafter, to tailor the dispensing characteristics of the roll. For instance, in dispensing applications from the roll exterior

where sheet 11 would be released first, an overlapping or interleaving configuration that locks the sheets together more is required. On the other hand, if sheet 14 is to be dispensed first, less interleaving is required.

- 5 Figure 3 portrays a tissue product 20 comprising a hexagonal dispensing carton 21 for roll 10 designed for axial dispensing of the tissues. Here roll 10 (depicted by dashed lines) has been placed into the hexagonal carton containing an end dispensing opening 22. The unique configuration of the wound overlapped sheets leaves the next tissue 15
10 "standing up." As a result, poly flaps and the like are not required to keep sheet 15 from falling back into roll 10. Such may be provided as a desirable sanitary feature, however. The unique configuration of the wound tissues also lends itself to many different carton shapes and sizes. Round, hexagonal, square or other geometric shapes can be used to
15 provide aesthetically pleasing cartons for the consumer.

- Figure 4 shows a tissue product 30 for circumferential dispensing from the outside of roll 10. Hexagonal carton 31 is designed with slot 32 for dispensing of the sheets. Roll 10 can be coreless or wound on a core if desired for manufacturing reasons. As outer sheet 11 is pulled
20 from slot 32, roll 10 will rotate within the carton due to the overlapping of the sheets within the roll. This allows the next sheet to travel partially through slot 32 until forces are no longer sufficient to cause it to travel further as sheet 11 is withdrawn.

- Figures 5 and 5A illustrate one embodiment of overlapping discrete
25 consecutive tissue sheets in accordance with this invention. Shown are discrete tissue sheets 41, 42, 43 and 44. The sheets are overlapped by a distance "x" as shown. The hidden edges of the tissues are represented by dashed lines. The individual sheets can be unfolded flat sheets, or they can be folded in any configuration.

- 30 Figures 6 and 6A illustrate another embodiment of overlapping discrete consecutive sheets for use in accordance with this invention. In this embodiment, the individual tissue sheets 51, 52, 53 and 54 are not simply overlapped, but also interleaved. The individual sheets are V-folded, with one end of each consecutive sheet partially opened and
35 folded around the end of the previous V-folded sheet.

- Figures 7 and 7A illustrate another method of overlapping discrete consecutive sheets for use in accordance with this invention. In this embodiment, the individual sheets 61, 62, 63 and 64 are C-folded sheets.

Similar to the embodiment illustrated in Figure 6A, the sheets are also interleaved with one end of each sheet being folded around the following sheet and the other end folded within the previous sheet.

Figures 8 and 8A illustrate another method of overlapping discrete 5 consecutive sheets 61, 62, 63 and 64 in which both ends of a given sheet interact with both the previous and following consecutive sheets in the same way. Specifically, both ends of sheet 62 are interleaved within the previous and subsequent sheets 61 and 63, respectively.

Figure 9 illustrates an overlapping winder 100 for the production of 10 roll 10 comprising the following steps. Roll 101 which has been previously slit, and crimped if a multi-ply product, is unwound such that web 102 passes over folding board 103. Folding board 103 can be a "C", "Y", or "Z" type folding board. Alternatively, if no fold is desired, folding board 103 may simply be removed from the web path. Folded web 15 104 is pulled into the nip between belt 107 and cut-off roller 105. The surface of roller 105 is made from a soft rubber material. This creates a good surface for pulling web 104 into the cut-off area and helps to crease the fold into web 104. Cut-off rollers 105 and 106 have a single knife imbedded in their outer surfaces. The circumference of these 20 rollers is made equal to the desired length for the discrete sheet to be overlapped. Belt 107 has appropriately spaced slots for the knife on cut-off roller 106. Folded web 104, after passing cut-off rollers 105 and 106, is severed into a discrete sheet 123. Belts 110 and 107 contain sheet 123 after it has been severed. Idler pulleys 112 and 108 guide 25 their respective belts. Vacuum box 111, in combination with holes in belt 110, assures sheet 123 will follow belt 110 after passing idler pulley 108 and not travel with belt 107 around the periphery of idler pulley 108. Transfer to belt 118 is accomplished by vacuum box 117. The degree of overlap between subsequent sheets can be altered by moving 30 items 105-112 back and forth as indicated by arrow 124 relative to the forward part of overlapping winder 100 and varying the relative speeds between belt 110 and 118. The movement and relative speeds can be accomplished while the machine is winding to vary the overlap through the radius of roll 122. After transfer of sheet 123 to belt 118, the 35 overlapped sheets are contained between belts 118 and belt 114. Belts 118 and 114 are guided by pulleys 113, 115, 116, 119, 120. The nip created between belts 118 and 114 not only keeps the overlapped sheets from flying loose during transport but also helps to increase the

friction engagement between the overlapped sheets. After traversing the length of belt 114, sheet 125 is ready to be wound onto roll 122. Roll 122 is supported by mandrel 126 which has a lengthwise slot in it. For coreless products, the first overlapped sheet is placed into the slot 5 to begin winding the roll. For product forms requiring a core, the core is placed on to the mandrel and the overlapped sheet is adhered to it by appropriate means. The winding roll 122 is controlled by roller 120 and pneumatic cylinder 121 in accordance with known winding principles. If a tighter wound roll is desired, a larger nip load is used which can be 10 accomplished by increasing the pressure to cylinder 121. When the desired number of sheets have been wound onto roll 122, it is removed from mandrel 126 and the process is repeated for additional rolls.

Examples

15 Example 1.

A tissue product of this invention was made by overlapping and winding individual (discrete) V-folded facial tissue sheets. Facial tissue sheets with dimensions of 8.5 inches x 9 inches were folded in half to obtain dimensions of 4.25 inches x 9 inches. Each V-folded sheet 20 was laid down such that the long dimension of the tissue overlapped the previous sheet in the long dimension by 4 inches. The length of overlapped tissues was then rolled up (referring to Figure 5A) by rotating the left edge of sheet 41 clockwise and continuing to turn and roll up the tissues. Ninety tissues were overlapped and rolled up. The 25 wound roll of discrete overlapped tissues was then placed in a typical upright carton of measuring 4 3/8 inches by 4 1/4 inches by 5 1/4 inches.

Dispensing was tested by pulling individual sheets through the opening on the upper surface of the carton. A failure of the sheet to follow the prior sheet through the carton opening was called a fall back. 30 The first 88 sheets dispensed without fall back. The last two sheets did not follow the previous sheets through the opening but remained upright and near the opening and were thus easy to retrieve.

Example 2.

A tissue product of this invention was made by overlapping 30 C-folded sheets (8.5 inches wide x 9 inches long, unfolded). The C-folded tissue sheets had folded dimensions of 4.5 inches x 9 inches. The first sheet was laid down and overlapped by a second sheet for a length of 4-1/2 inches. The third tissue overlapped the second by 2-1/2 inches as

did all subsequent tissues. All tissues were laid down on a conveyer belt. The leading end of the first tissue was inserted into a mandrel which rotated to wind up the overlapped tissues as the conveyer belt moved the tissues toward the mandrel. The diameter of the mandrel was 1-
5 1/2 inches. The nip formed between the mandrel and the belt was controlled to provide a nip load of about 1 pound per lineal inch (pli). The resulting tissue product had a diameter of 2-1/2 inches and was removed from the mandrel, resulting in a coreless roll. Because the tissue product was wound under pressure, the interior sheets relaxed to
10 fill the void left by the mandrel and this made the initial dispensing easier. Only one fall back occurred in each of two dispensing tests.

It will be appreciated that the foregoing examples, given for purposes of illustration, are not to be construed as limiting the scope of this invention, which is defined by the following claims and all
15 equivalents thereto.

We claim:

1. A tissue product comprising a roll of multiple, discrete, consecutive tissue sheets which overlap each other in the circumferential direction of the roll.
2. The product of Claim 1 wherein the tissue sheets are interleaved.
3. The product of Claim 1 wherein the roll contains a core.
4. The product of Claim 1 wherein the roll is coreless.
5. The product of Claim 1 wherein the tissue sheets are overlapped by at least about 1/8 inch.
6. The product of Claim 1 wherein the tissue sheets are overlapped by at least about 1 inch.
7. The product of Claim 1 wherein the tissue sheets are overlapped by at least about 2 inches.
8. The product of Claim 1 wherein the tissue sheets are overlapped by about 4 inches.
9. The product of Claim 1 wherein the tissue sheets are overlapped by about one-half the length of a tissue sheet.
10. The product of Claim 1 wherein the extent of overlap differs within the roll.
11. The product of Claim 1 wherein the extent of overlap is substantially the same within the roll.
12. The product of Claim 1 wherein the distance the sheets near the center of the roll are overlapped is less than the distance the sheets near the periphery of the roll are overlapped.
13. The product of Claim 1 wherein the tissue sheets are not folded.

14. The product of Claim 1 wherein the tissue sheets are single plies.
15. The product of Claim 1 wherein the tissue sheets are multiple plies.
16. The product of Claim 1 wherein the tissue sheets are C-folded and overlapped.
17. The product of Claim 1 wherein the tissue sheets are C-folded and interleaved.
18. The product of Claim 1 wherein the tissue sheets are V-folded and overlapped.
19. The product of Claim 1 wherein the tissue sheets are V-folded and interleaved.
20. The product of Claim 1 wherein the tissue sheets are folded napkins.
21. The product of Claim 1 wherein the tissue sheets are kitchen towels.
22. The product of Claim 1 wherein the tissue sheets are facial tissues.
23. The product of Claim 1 wherein the tissue sheets are bath tissues.
24. A method of making a tissue product comprising the steps of:
(a) cutting a continuous sheet of tissue into discrete, consecutive sheets; (b) overlapping each discrete sheet with the previous sheet; and (c) winding the overlapped sheets into a roll.
25. The method of Claim 24 wherein the discrete sheets are folded prior to overlapping.
26. The method of Claim 25 wherein the discrete sheets are C-folded.
27. The method of Claim 25 wherein the discrete sheets are V-folded.
28. The method of Claim 24 wherein the discrete sheets are folded after being overlapped, resulting in interleaved consecutive sheets.

29. The method of Claim 28 wherein the discrete sheets are C-folded.
30. The method of Claim 28 wherein the discrete sheets are V-folded.
31. The method of Claim 24 wherein the overlapped sheets are wound onto a core.
32. The method of Claim 24 wherein the overlapped sheets are wound onto a mandrel, which is removed from the wound roll, resulting in a coreless roll.

1 / 5

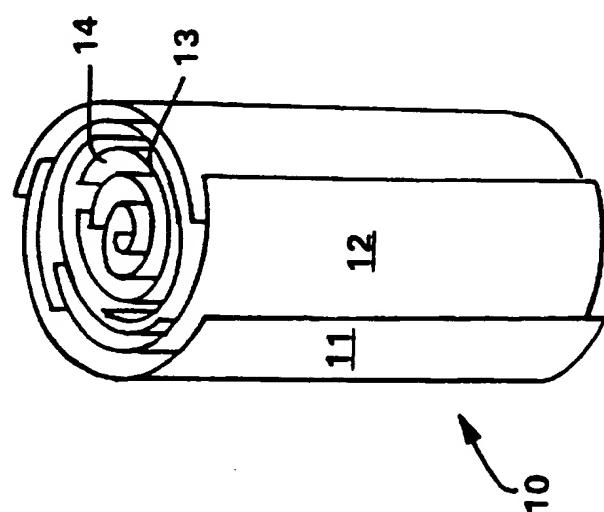


FIG. 2

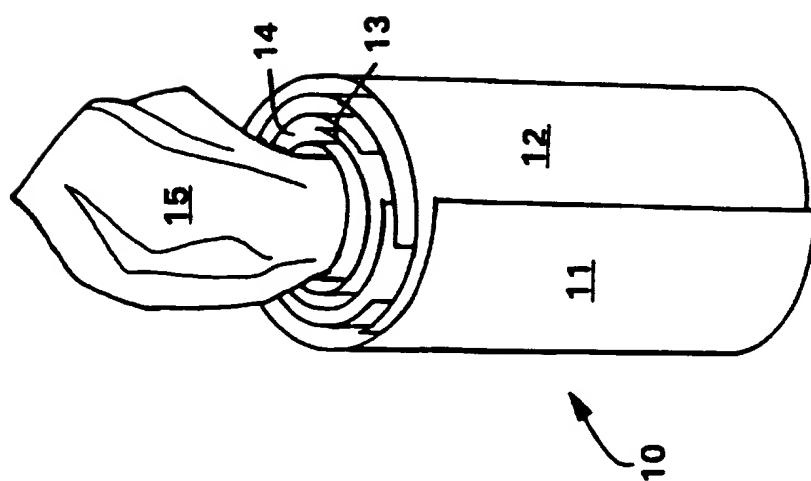
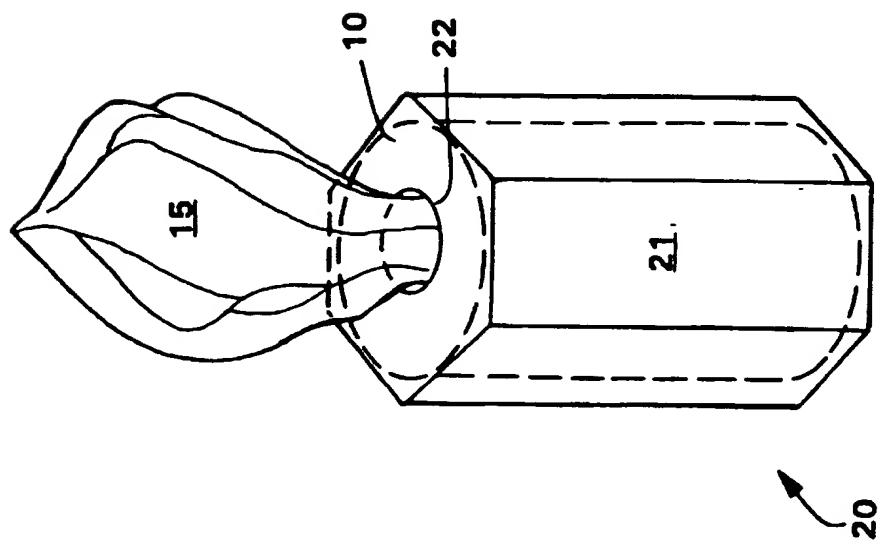
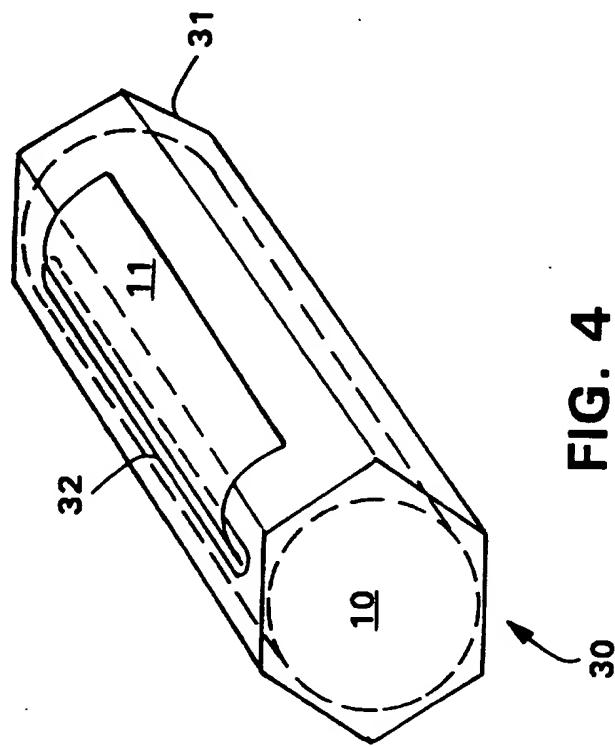
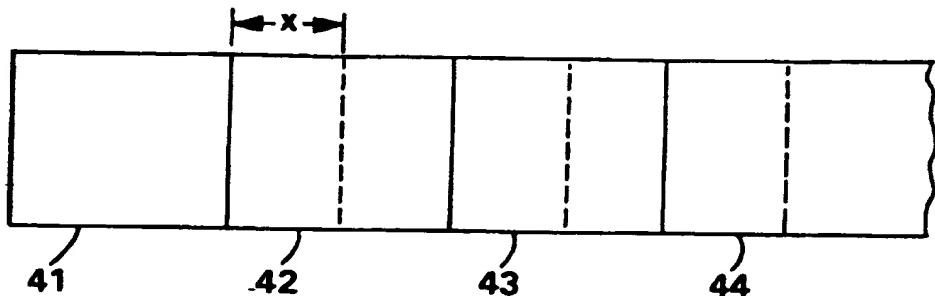
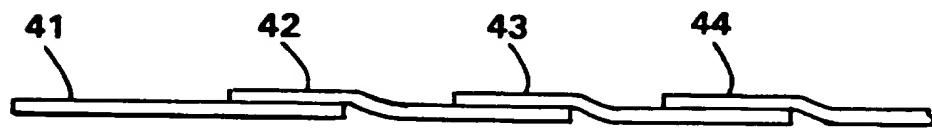
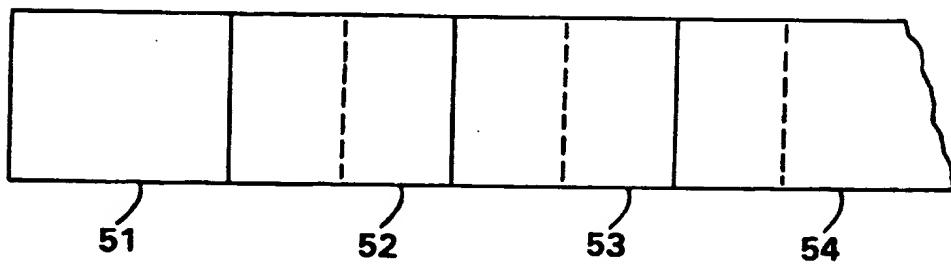


FIG. 1

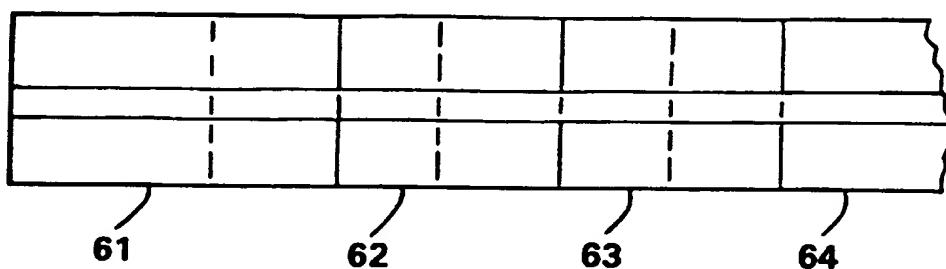
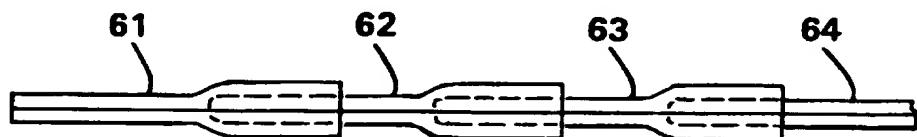
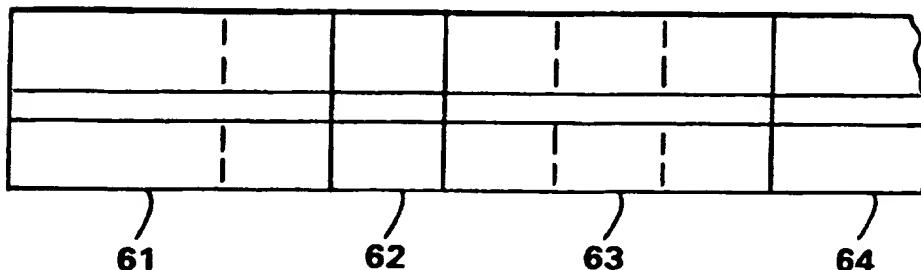
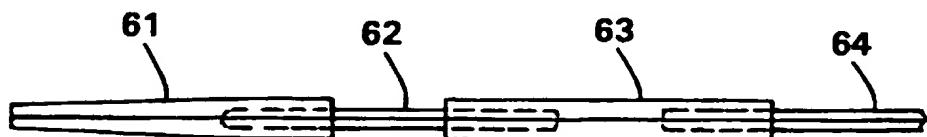
2/5



3/5

**FIG. 5****FIG. 5A****FIG. 6****FIG. 6A**

4 / 5

**FIG. 7****FIG. 7A****FIG. 8****FIG. 8A**

5 / 5

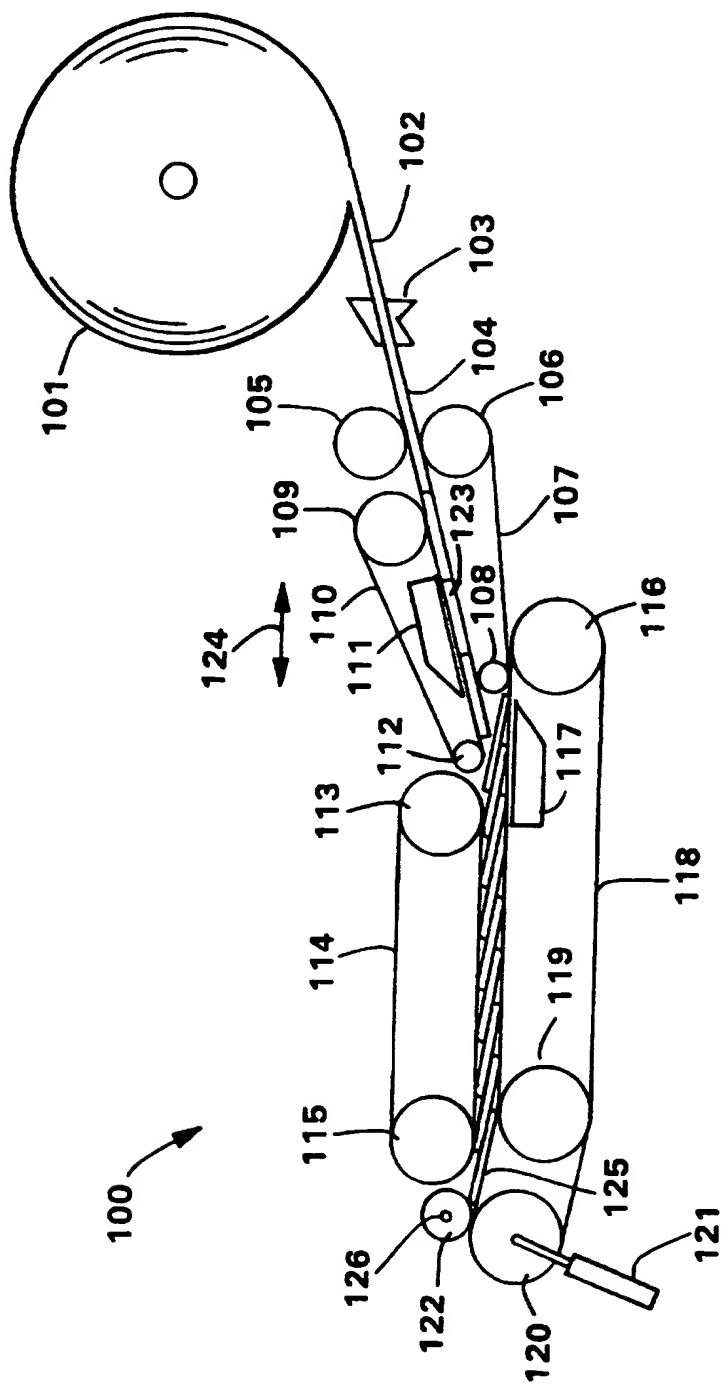


FIG. 9

INTERNATIONAL SEARCH REPORT

Inten. Appl. No.
PCT/US 95/08821A. CLASSIFICATION OF SUBJECT MATTER
B 65 H 29/66

According to International Patent Classification (IPC) or to both national classification and IPC 6

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B 65 H, A 47 K, B 31 D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|--|-----------------------|
| X | EP, A, 0 364 896 (NAKAMURA) 25 April 1990 (25.04.90), claims 3,8; fig. 4. -- | 1, 2, 4, 24 |
| Y | US, A, 5 246 137 (SCHUTZ) 21 September 1993 (21.09.93), abstract; fig. 2. -- | 1 |
| Y | US, A, 4 865 221 (JACKSON) 12 September 1989 (12.09.89), fig. 2,3. -- | 1 |
| A | DE, A, 3 330 485 (FERAG) 08 March 1984 (08.03.84), the whole document. | 1-32 |

 Further documents are listed in the continuation of box C. Patent family members are listed in annex.

* Special categories of cited documents :

- 'A' document defining the general state of the art which is not considered to be of particular relevance
- 'E' earlier document but published on or after the international filing date
- 'L' document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- 'O' document referring to an oral disclosure, use, exhibition or other means
- 'P' document published prior to the international filing date but later than the priority date claimed

'T' later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

'X' document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

'Y' document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

& document member of the same patent family

Date of the actual completion of the international search
09 October 1995

Date of mailing of the international search report

02.11.95

Name and mailing address of the ISA
European Patent Office, P.B. 5818 Patendaan 2
NL - 2280 HV Rijswijk
Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+ 31-70) 340-3016

Authorized officer

LOSENICKY e.h.

INTERNATIONAL SEARCH REPORT

-2-

| | |
|------|----------------------|
| Int. | Int'l Application No |
| | PCT/US 95/08821 |

C(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|--|-----------------------|
| A | EP, A, 0 243 906 (FERAG) 04 November 1987 (04.11.87), the whole document. -- | 1-32 |
| A | DE, A, 2 725 547 (WOMAKO) 21 December 1978 (21.12.78), the whole document. -- | 24 |
| A | DE, A, 2 909 831 (HAMILTON) 17 January 1980 (17.01.80), the whole document. ---- | 24 |

ANHANG

zum internationalen Recherchenbericht über die internationale Patentanmeldung Nr.

ANNEX

to the International Search Report to the International Patent Application No.

ANNEXE

au rapport de recherche international relatif à la demande de brevet international n°

PCT/US 95/08821 SAE 114061

In diesem Anhang sind die Mitglieder der Patentfamilien der im obengenannten internationalen Recherchenbericht angeführten Patentdokumente angegeben. Diese Angaben dienen nur zur Unter-richtung und erfolgen ohne Gewähr.

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The Office is in no way liable for these particulars which are given merely for the purpose of information.

La présente annexe indique les membres de la famille de brevets relatifs aux documents de brevets cités dans le rapport de recherche international visée ci-dessus. Les renseignements fournis sont donnés à titre indica-tif et n'engagent pas la responsabilité de l'Office.

| In Recherchenbericht angeführtes Patentdokument Patent document cited in search report Document de brevet cité dans le rapport de recherche | Datum der Veröffentlichung Publication date Date de publication | Mitglied(er) der Patentfamilie Patent family member(s) Membre(s) de la famille de brevets | Datum der Veröffentlichung Publication date Date de publication |
|---|---|--|--|
| EP A1 364896 | 25-04-90 | AT E 102803 AU A1 42882/89 AU B2 8122004 CA AA 20006550 CA C 20006550 DE CO 68912880 DE T1 68912880 EP B1 364896 ES T3 2050201 HK A 951795 US A 5076424 US A 5152121 JP A2 2258585 | 15-04-94 17-05-90 04-05-91 15-04-90 27-12-93 21-04-94 18-08-94 16-03-94 18-05-94 28-06-95 01-12-91 06-10-92 19-10-90 |
| US A 3246137 | 21-09-93 | Keine - none - rien | |
| US A 4863221 | 12-09-89 | US A 4741944 | 03-05-88 |
| DE A1 3330485 | 08-03-84 | AU A1 18582/83 AU B2 5602600 BR A 8304780 CA A1 1237793 CH A 65685 COS A2 83025 COS BC 26865 DD A0 30112899 DK AU 30112899 DK BR 30112899 DK DE 30112899 DK IT A0 30112899 DK IT D0 30112899 DK IT D1 30112899 DK IT D2 30112899 DK IT D3 30112899 DK IT D4 30112899 DK IT D5 30112899 DK IT D6 30112899 DK IT D7 30112899 DK IT D8 30112899 DK IT D9 30112899 DK IT D10 30112899 DK IT D11 30112899 DK IT D12 30112899 DK IT D13 30112899 DK IT D14 30112899 DK IT D15 30112899 DK IT D16 30112899 DK IT D17 30112899 DK IT D18 30112899 DK IT D19 30112899 DK IT D20 30112899 DK IT D21 30112899 DK IT D22 30112899 DK IT D23 30112899 DK IT D24 30112899 DK IT D25 30112899 DK IT D26 30112899 DK IT D27 30112899 DK IT D28 30112899 DK IT D29 30112899 DK IT D30 30112899 DK IT D31 30112899 DK IT D32 30112899 DK IT D33 30112899 DK IT D34 30112899 DK IT D35 30112899 DK IT D36 30112899 DK IT D37 30112899 DK IT D38 30112899 DK IT D39 30112899 DK IT D40 30112899 DK IT D41 30112899 DK IT D42 30112899 DK IT D43 30112899 DK IT D44 30112899 DK IT D45 30112899 DK IT D46 30112899 DK IT D47 30112899 DK IT D48 30112899 DK IT D49 30112899 DK IT D50 30112899 DK IT D51 30112899 DK IT D52 30112899 DK IT D53 30112899 DK IT D54 30112899 DK IT D55 30112899 DK IT D56 30112899 DK IT D57 30112899 DK IT D58 30112899 DK IT D59 30112899 DK IT D60 30112899 DK IT D61 30112899 DK IT D62 30112899 DK IT D63 30112899 DK IT D64 30112899 DK IT D65 30112899 DK IT D66 30112899 DK IT D67 30112899 DK IT D68 30112899 DK IT D69 30112899 DK IT D70 30112899 DK IT D71 30112899 DK IT D72 30112899 DK IT D73 30112899 DK IT D74 30112899 DK IT D75 30112899 DK IT D76 30112899 DK IT D77 30112899 DK IT D78 30112899 DK IT D79 30112899 DK IT D80 30112899 DK IT D81 30112899 DK IT D82 30112899 DK IT D83 30112899 DK IT D84 30112899 DK IT D85 30112899 DK IT D86 30112899 DK IT D87 30112899 DK IT D88 30112899 DK IT D89 30112899 DK IT D90 30112899 DK IT D91 30112899 DK IT D92 30112899 DK IT D93 30112899 DK IT D94 30112899 DK IT D95 30112899 DK IT D96 30112899 DK IT D97 30112899 DK IT D98 30112899 DK IT D99 30112899 DK IT D100 30112899 DK IT D101 30112899 DK IT D102 30112899 DK IT D103 30112899 DK IT D104 30112899 DK IT D105 30112899 DK IT D106 30112899 DK IT D107 30112899 DK IT D108 30112899 DK IT D109 30112899 DK IT D110 30112899 DK IT D111 30112899 DK IT D112 30112899 DK IT D113 30112899 DK IT D114 30112899 DK IT D115 30112899 DK IT D116 30112899 DK IT D117 30112899 DK IT D118 30112899 DK IT D119 30112899 DK IT D120 30112899 DK IT D121 30112899 DK IT D122 30112899 DK IT D123 30112899 DK IT D124 30112899 DK IT D125 30112899 DK IT D126 30112899 DK IT D127 30112899 DK IT D128 30112899 DK IT D129 30112899 DK IT D130 30112899 DK IT D131 30112899 DK IT D132 30112899 DK IT D133 30112899 DK IT D134 30112899 DK IT D135 30112899 DK IT D136 30112899 DK IT D137 30112899 DK IT D138 30112899 DK IT D139 30112899 DK IT D140 30112899 DK IT D141 30112899 DK IT D142 30112899 DK IT D143 30112899 DK IT D144 30112899 DK IT D145 30112899 DK IT D146 30112899 DK IT D147 30112899 DK IT D148 30112899 DK IT D149 30112899 DK IT D150 30112899 DK IT D151 30112899 DK IT D152 30112899 DK IT D153 30112899 DK IT D154 30112899 DK IT D155 30112899 DK IT D156 30112899 DK IT D157 30112899 DK IT D158 30112899 DK IT D159 30112899 DK IT D160 30112899 DK IT D161 30112899 DK IT D162 30112899 DK IT D163 30112899 DK IT D164 30112899 DK IT D165 30112899 DK IT D166 30112899 DK IT D167 30112899 DK IT D168 30112899 DK IT D169 30112899 DK IT D170 30112899 DK IT D171 30112899 DK IT D172 30112899 DK IT D173 30112899 DK IT D174 30112899 DK IT D175 30112899 DK IT D176 30112899 DK IT D177 30112899 DK IT D178 30112899 DK IT D179 30112899 DK IT D180 30112899 DK IT D181 30112899 DK IT D182 30112899 DK IT D183 30112899 DK IT D184 30112899 DK IT D185 30112899 DK IT D186 30112899 DK IT D187 30112899 DK IT D188 30112899 DK IT D189 30112899 DK IT D190 30112899 DK IT D191 30112899 DK IT D192 30112899 DK IT D193 30112899 DK IT D194 30112899 DK IT D195 30112899 DK IT D196 30112899 DK IT D197 30112899 DK IT D198 30112899 DK IT D199 30112899 DK IT D200 30112899 DK IT D201 30112899 DK IT D202 30112899 DK IT D203 30112899 DK IT D204 30112899 DK IT D205 30112899 DK IT D206 30112899 DK IT D207 30112899 DK IT D208 30112899 DK IT D209 30112899 DK IT D210 30112899 DK IT D211 30112899 DK IT D212 30112899 DK IT D213 30112899 DK IT D214 30112899 DK IT D215 30112899 DK IT D216 30112899 DK IT D217 30112899 DK IT D218 30112899 DK IT D219 30112899 DK IT D220 30112899 DK IT D221 30112899 DK IT D222 30112899 DK IT D223 30112899 DK IT D224 30112899 DK IT D225 30112899 DK IT D226 30112899 DK IT D227 30112899 DK IT D228 30112899 DK IT D229 30112899 DK IT D230 30112899 DK IT D231 30112899 DK IT D232 30112899 DK IT D233 30112899 DK IT D234 30112899 DK IT D235 30112899 DK IT D236 30112899 DK IT D237 30112899 DK IT D238 30112899 DK IT D239 30112899 DK IT D240 30112899 DK IT D241 30112899 DK IT D242 30112899 DK IT D243 30112899 DK IT D244 30112899 DK IT D245 30112899 DK IT D246 30112899 DK IT D247 30112899 DK IT D248 30112899 DK IT D249 30112899 DK IT D250 30112899 DK IT D251 30112899 DK IT D252 30112899 DK IT D253 30112899 DK IT D254 30112899 DK IT D255 30112899 DK IT D256 30112899 DK IT D257 30112899 DK IT D258 30112899 DK IT D259 30112899 DK IT D260 30112899 DK IT D261 30112899 DK IT D262 30112899 DK IT D263 30112899 DK IT D264 30112899 DK IT D265 30112899 DK IT D266 30112899 DK IT D267 30112899 DK IT D268 30112899 DK IT D269 30112899 DK IT D270 30112899 DK IT D271 30112899 DK IT D272 30112899 DK IT D273 30112899 DK IT D274 30112899 DK IT D275 30112899 DK IT D276 30112899 DK IT D277 30112899 DK IT D278 30112899 DK IT D279 30112899 DK IT D280 30112899 DK IT D281 30112899 DK IT D282 30112899 DK IT D283 30112899 DK IT D284 30112899 DK IT D285 30112899 DK IT D286 30112899 DK IT D287 30112899 DK IT D288 30112899 DK IT D289 30112899 DK IT D290 30112899 DK IT D291 30112899 DK IT D292 30112899 DK IT D293 30112899 DK IT D294 30112899 DK IT D295 30112899 DK IT D296 30112899 DK IT D297 30112899 DK IT D298 30112899 DK IT D299 30112899 DK IT D300 30112899 DK IT D301 30112899 DK IT D302 30112899 DK IT D303 30112899 DK IT D304 30112899 DK IT D305 30112899 DK IT D306 30112899 DK IT D307 30112899 DK IT D308 30112899 DK IT D309 30112899 DK IT D310 30112899 DK IT D311 30112899 DK IT D312 30112899 DK IT D313 30112899 DK IT D314 30112899 DK IT D315 30112899 DK IT D316 30112899 DK IT D317 30112899 DK IT D318 30112899 DK IT D319 30112899 DK IT D320 30112899 DK IT D321 30112899 DK IT D322 30112899 DK IT D323 30112899 DK IT D324 30112899 DK IT D325 30112899 DK IT D326 30112899 DK IT D327 30112899 DK IT D328 30112899 DK IT D329 30112899 DK IT D330 30112899 DK IT D331 30112899 DK IT D332 30112899 DK IT D333 30112899 DK IT D334 30112899 DK IT D335 30112899 DK IT D336 30112899 DK IT D337 30112899 DK IT D338 30112899 DK IT D339 30112899 DK IT D340 30112899 DK IT D341 30112899 DK IT D342 30112899 DK IT D343 30112899 DK IT D344 30112899 DK IT D345 30112899 DK IT D346 30112899 DK IT D347 30112899 DK IT D348 30112899 DK IT D349 30112899 DK IT D350 30112899 DK IT D351 30112899 DK IT D352 30112899 DK IT D353 30112899 DK IT D354 30112899 DK IT D355 30112899 DK IT D356 30112899 DK IT D357 30112899 DK IT D358 30112899 DK IT D359 30112899 DK IT D360 30112899 DK IT D361 30112899 DK IT D362 30112899 DK IT D363 30112899 DK IT D364 30112899 DK IT D365 30112899 DK IT D366 30112899 DK IT D367 30112899 DK IT D368 30112899 DK IT D369 30112899 DK IT D370 30112899 DK IT D371 30112899 DK IT D372 30112899 DK IT D373 30112899 DK IT D374 30112899 DK IT D375 30112899 DK IT D376 30112899 DK IT D377 30112899 DK IT D378 30112899 DK IT D379 30112899 DK IT D380 30112899 DK IT D381 30112899 DK IT D382 30112899 DK IT D383 30112899 DK IT D384 30112899 DK IT D385 30112899 DK IT D386 30112899 DK IT D387 30112899 DK IT D388 30112899 DK IT D389 30112899 DK IT D390 30112899 DK IT D391 30112899 DK IT D392 30112899 DK IT D393 30112899 DK IT D394 30112899 DK IT D395 30112899 DK IT D396 30112899 DK IT D397 30112899 DK IT D398 30112899 DK IT D399 30112899 DK IT D400 30112899 DK IT D401 30112899 DK IT D402 30112899 DK IT D403 30112899 DK IT D404 30112899 DK IT D405 30112899 DK IT D406 30112899 DK IT D407 30112899 DK IT D408 30112899 DK IT D409 30112899 DK IT D410 30112899 DK IT D411 30112899 DK IT D412 30112899 DK IT D413 30112899 DK IT D414 30112899 DK IT D415 30112899 DK IT D416 30112899 DK IT D417 30112899 DK IT D418 30112899 DK IT D419 30112899 DK IT D420 30112899 DK IT D421 30112899 DK IT D422 30112899 DK IT D423 30112899 DK IT D424 30112899 DK IT D425 30112899 DK IT D426 30112899 DK IT D427 30112899 DK IT D428 30112899 DK IT D429 30112899 DK IT D430 30112899 DK IT D431 30112899 DK IT D432 30112899 DK IT D433 30112899 DK IT D434 30112899 DK IT D435 30112899 DK IT D436 30112899 DK IT D437 30112899 DK IT D438 30112899 DK IT D439 30112899 DK IT D440 30112899 DK IT D441 30112899 DK IT D442 30112899 DK IT D443 30112899 DK IT D444 30112899 DK IT D445 30112899 DK IT D446 30112899 DK IT D447 30112899 DK IT D448 30112899 DK IT D449 30112899 DK IT D450 30112899 DK IT D451 30112899 DK IT D452 30112899 DK IT D453 30112899 DK IT D454 30112899 DK IT D455 30112899 DK IT D456 30112899 DK IT D457 30112899 DK IT D458 30112899 DK IT D459 30112899 DK IT D460 30112899 DK IT D461 30112899 DK IT D462 30112899 DK IT D463 30112899 DK IT D464 30112899 DK IT D465 30112899 DK IT D466 30112899 DK IT D467 30112899 DK IT D468 30112899 DK IT D469 30112899 DK IT D470 30112899 DK IT D471 30112899 DK IT D472 30112899 DK IT D473 30112899 DK IT D474 30112899 DK IT D475 30112899 DK IT D476 30112899 DK IT D477 30112899 DK IT D478 30112899 DK IT D479 30112899 DK IT D480 30112899 DK IT D481 30112899 DK IT D482 30112899 DK IT D483 30112899 DK IT D484 30112899 DK IT D485 30112899 DK IT D486 30112899 DK IT D487 30112899 DK IT D488 30112899 DK IT D489 30112899 DK IT D490 30112899 DK IT D491 30112899 DK IT D492 30112899 DK IT D493 30112899 DK IT D494 30112899 DK IT D495 30112899 DK IT D496 30112899 DK IT D497 30112899 DK IT D498 30112899 DK IT D499 30112899 DK IT D500 30112899 DK IT D501 30112899 DK IT D502 30112899 DK IT D503 30112899 DK IT D504 30112899 DK IT D505 30112899 DK IT D506 30112899 DK IT D507 30112899 DK IT D508 30112899 DK IT D509 30112899 DK IT D510 30112899 DK IT D511 30112899 DK IT D512 30112899 DK IT D513 30112899 DK IT D514 30112899 DK IT D515 30112899 DK IT D516 30112899 DK IT D517 30112899 DK IT D518 30112899 DK IT D519 30112899 DK IT D520 30112899 DK IT D521 30112899 DK IT D522 30112899 DK IT D523 30112899 DK IT D524 30112899 DK IT D525 30112899 DK IT D526 30112899 DK IT D527 30112899 DK IT D528 30112899 DK IT D529 30112899 DK IT D530 30112899 DK IT D531 30112899 DK IT D532 30112899 DK IT D533 30112899 DK IT D534 30112899 DK IT D535 30112899 DK IT D536 30112899 DK IT D537 30112899 DK IT D538 30112899 DK IT D539 30112899 DK IT D540 30112899 DK IT D541 30112899 DK IT D542 30112899 DK IT D543 30112899 DK IT D544 30112899 DK IT D545 30112899 DK IT D546 30112899 DK IT D547 30112899 DK IT D548 30112899 DK IT D549 30112899 DK IT D550 30112899 DK IT D551 30112899 DK IT D552 30112899 DK IT D553 30112899 DK IT D554 30112899 DK IT D555 30112899 DK IT D556 30112899 DK IT D557 30112899 DK IT D558 30112899 DK IT D559 30112899 DK IT D560 30112899 DK IT D561 30112899 DK IT D562 30112899 DK IT D563 30112899 DK IT D564 30112899 DK IT D565 30112899 DK IT D566 30112899 DK IT D567 30112899 DK IT D568 30112899 DK IT D569 30112899 DK IT D570 30112899 DK IT D571 30112899 DK IT D572 30112899 DK IT D573 30112899 DK IT D574 30112899 DK IT D575 30112899 DK IT D576 30112899 DK IT D577 30112899 DK IT D578 30112899 DK IT D579 | |

| | | US A | 4967536 | 06-11-90 | |
|-------|---------|----------|---|--|--|
| DE A1 | 2725547 | 21-12-78 | CA A1 DE C1 FR A1 FR B1 GB A IT AO IT A US A | 1081722 2725547 2393753 2393753 1587336 7824151 1096466 4285513 | 15-07-80 22-12-83 05-01-79 22-04-82 01-04-81 02-06-78 26-08-85 20-08-81 |
| DE A1 | 2909831 | 17-01-80 | CA A1 DE U1 GB A1 GB B2 JP A2 US A | 1089889 7907000 2025373 2025373 55007175 4270743 | 18-11-80 25-08-83 23-01-80 14-07-82 18-01-80 02-06-81 |